

# Volkswagen's defeat device scandal . . .

## Challenges and opportunities

*Drew Kodjak and John German*

ClimateWorks Foundation's Oil  
Transportation Research and  
Intelligence Network (Oil TRAIN)  
October 29, 2015



I have created about 20 slides, and I've given myself about 40 minutes to run through them  
My purpose is to set the tone and historical touchstones for the two days that we will spend together.

# Key Messages

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- Dieselgate a “wake up call” - highlighting major deficiencies in government programs to ensure compliance with emission standards.
- General presumption that more stringent standards - both emissions and efficiency - will result in lower in-use emissions and fuel consumption.
- Unfortunately, growing body of evidence that this link may be much weaker than expected.
- Lack of compliance is eroding expected improvements in air pollution and climate change emissions.
- VW scandal offers unprecedented opportunity to drive major changes in government policies and programs to ensure real world reductions.

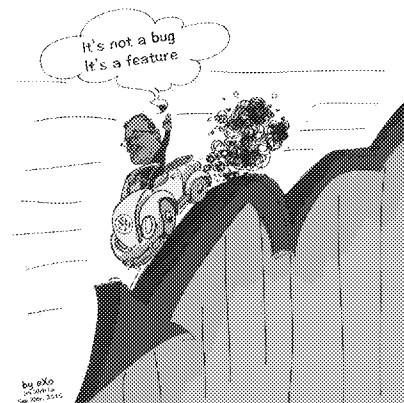
# Timeline of Volkswagen Defeat Device Investigation and Discovery

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- **2011/2012** – Joint Research Center of the European Commission releases real world emissions data on light-duty diesels; ICCT's European office concerned with elevated real world NOx emissions from Euro 4/5 passenger diesels in Europe.
- **February 2013** – ICCT contracts with West Virginia University to conduct real world emissions testing on three passenger diesel vehicles in California. CARB provides in-kind support via its test center in El Monte.
- **May 2014** – ICCT publishes its findings which show two of the three cars with 5 – 35X times the legal limit under normal driving conditions. We inform EPA, CARB, and VW.
- **December 2014** – VW agrees to a voluntary recall of passenger diesels.
- **May 2015** – CARB retests recalled vehicles and finds some improvement, but emissions are still high.
- **July-September 2015** – US EPA informs VW that it will not be granted license to sell 2016 vehicles in the US if the Agency's questions are not addressed fully. VW admits to defeat devices on September 3, 2015.
- **September 18, 2015** – US EPA, DOJ, and CARB announce a notice of violation against VW for using illegal defeat devices.
- **September 22, 2015** – VW announces that 11 million 2009-2015 diesel cars worldwide have the same "defeat device" software.
- **September 25, 2015** – US EPA and CARB issue updated requirements related to evaluation of defeat devices
- **October 7, 2015** – VW US CEO Horn discloses EPA is investigating VW emissions controls in 2016 diesels
- **October 23, 2015** – DUH releases report on Opel Zafira suspicious emission behavior <sup>3</sup>



## Some illustrative cartoons



**icct**  
INSTITUTE FOR  
CONSTRUCTION  
COSTS AND  
CONSTRUCTION  
TRENDS

by pko  
© 2011  
100 000 000



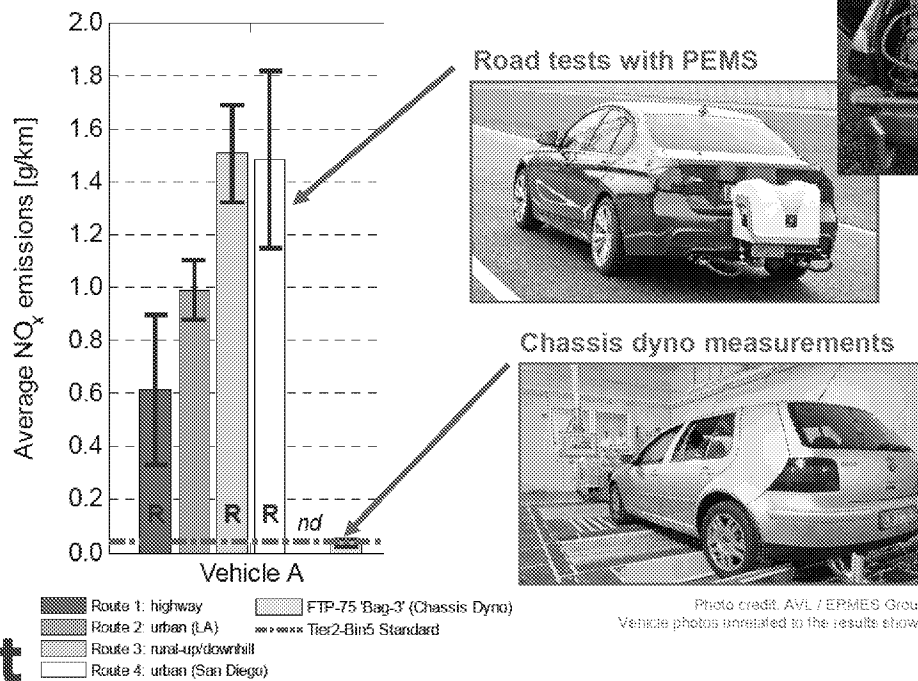
*'We've found the problem. You're looking at  
£18 billion plus parts and labour'*

## What the research tells us

- NOx emissions
- CO2 emissions

# ICCT Real World Testing in California

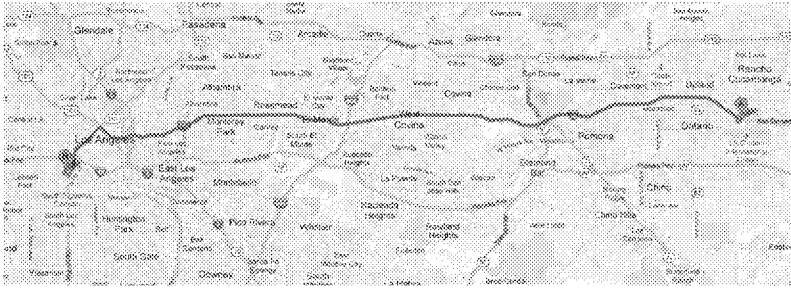
PEMS road tests (WVU); CARB dyno tests



# ICCT / WVU Study

## 5 Different Testing Routes

Route 1 – Highway (Los Angeles to Ontario, CA)



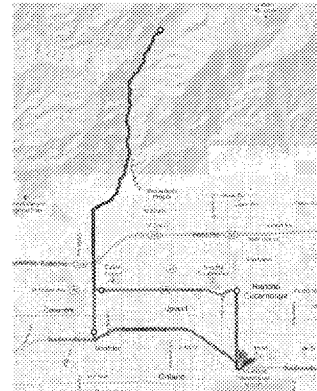
Route 2 – Urban (Los Angeles) – similar to original route used for development of the LA-4 / FTP-72



Route 4 – Urban  
(San Diego)

Route 5 – Urban  
(San Francisco)

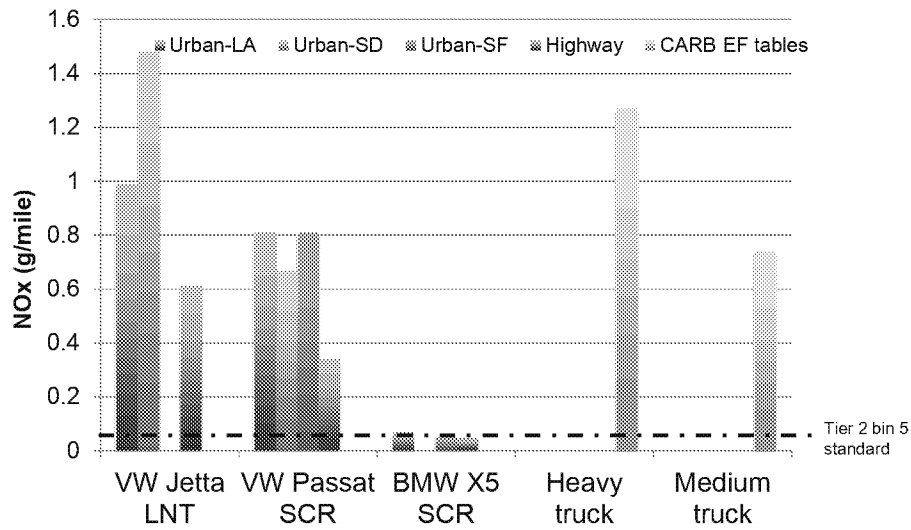
Route 3 - Suburban  
and Uphill/Downhill



# Real World NOx emissions

Jetta 15-35 times standards; Passat 5-20 times standards

- All vehicles met emission standards on FTP (not shown)
- The BMW X5 had high NOx emissions only during up/downhill driving (not shown)
- Lowest NO<sub>x</sub> during highway driving
- Urban NOx emissions from VW Jetta similar to 80,000 GVW 18-wheeler; VW Passat similar to medium-duty truck

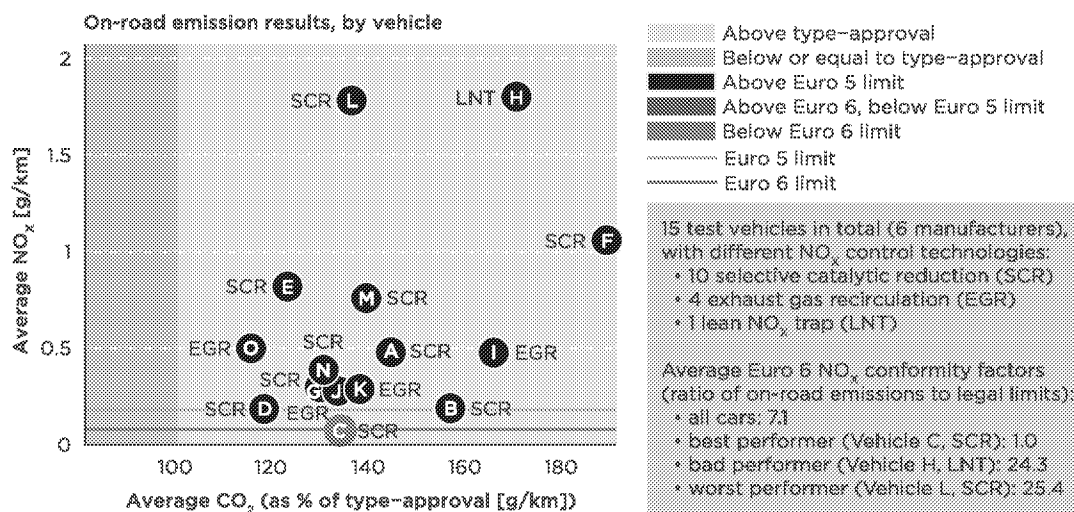




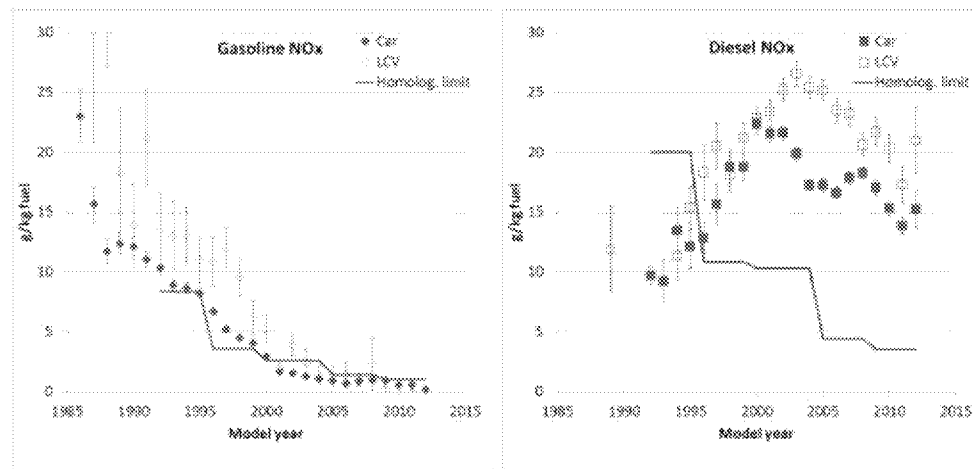
# ICCT's Diesel emissions meta-study

Average real world NO<sub>x</sub> is seven times Euro6 standards

## Average on-road emissions of NO<sub>x</sub> and CO<sub>2</sub>, by vehicle



# ICCT's PEMS testing confirmed by 13 years of Remote Sensing data

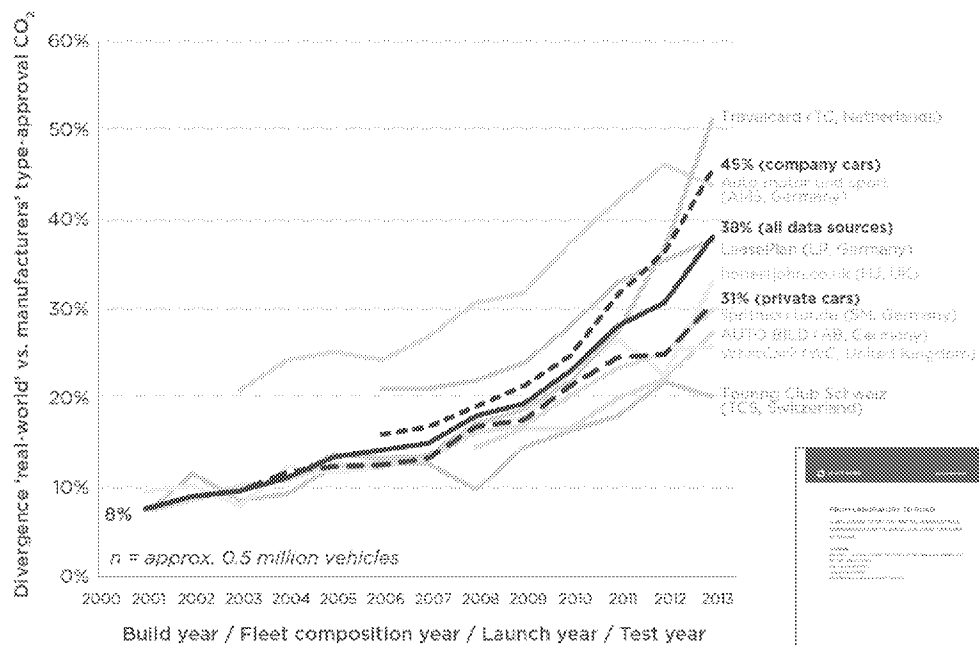


Chen & Borken-Kleefeld, Real-driving emissions from cars and light commercial vehicles - Results from 13 years remote sensing at Zurich/CH Atmospheric Environment, 88:157-164 (May 2014)

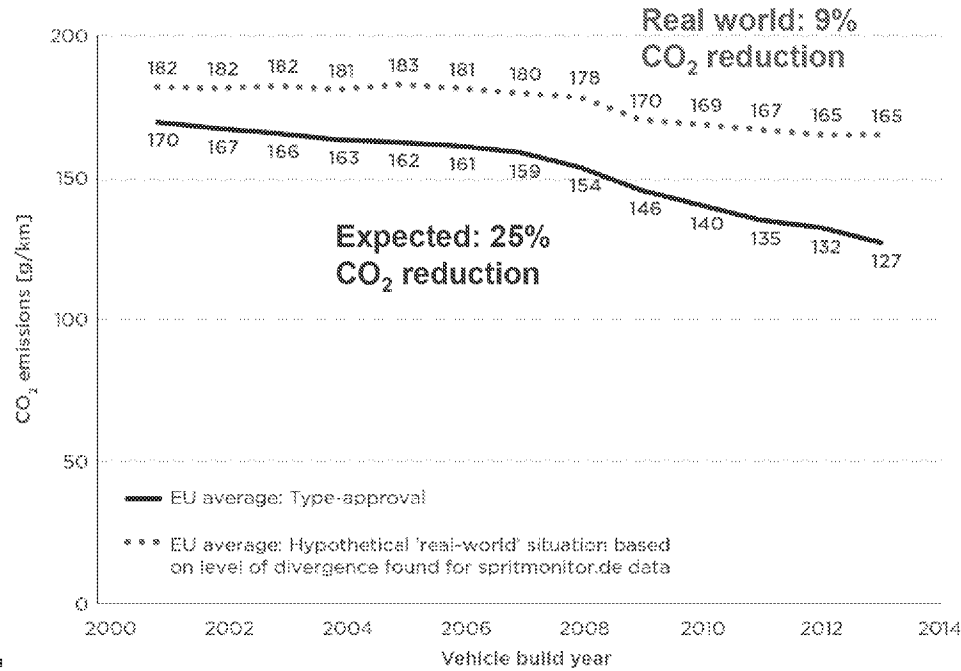


We report on long-term remote sensing measurements of light duty vehicle emissions at one site close to Zurich/Switzerland. The time series of annual measurements at the same site between 2000 and 2012, the same season, and virtually the same instrument is unique, probably worldwide. We analyze the development of unit exhaust emissions from model years 1985 until 2012, covering all five Euro emission limit stages in force. NOx emissions from both diesel cars and light commercial vehicles have actually increased in real-driving over time although emission limits have been progressively tightened. This behavior is explained mostly by a significant discrepancy between engine conditions during real-driving and the homologation test procedure. This discrepancy is not important for the other pollutants or for gasoline light duty vehicles, for which the emission control equipment is found working over a wide range of engine conditions. Our results confirm emission factors from the latest HBEFA model when deterioration and engine load are accounted for.

# It's not just about NOx . . . Real-world CO<sub>2</sub> in EU is 30+% higher than claimed



Growing gap in real world v. type approval emissions cut expected gains from European CO<sub>2</sub> standards more than half.



Increasing deployment of technologies that show a higher CO<sub>2</sub> reduction benefit in the test procedure than under real-world driving conditions.

The use of parts and calibrations for testing that are not representative of in-use parts and calibrations.

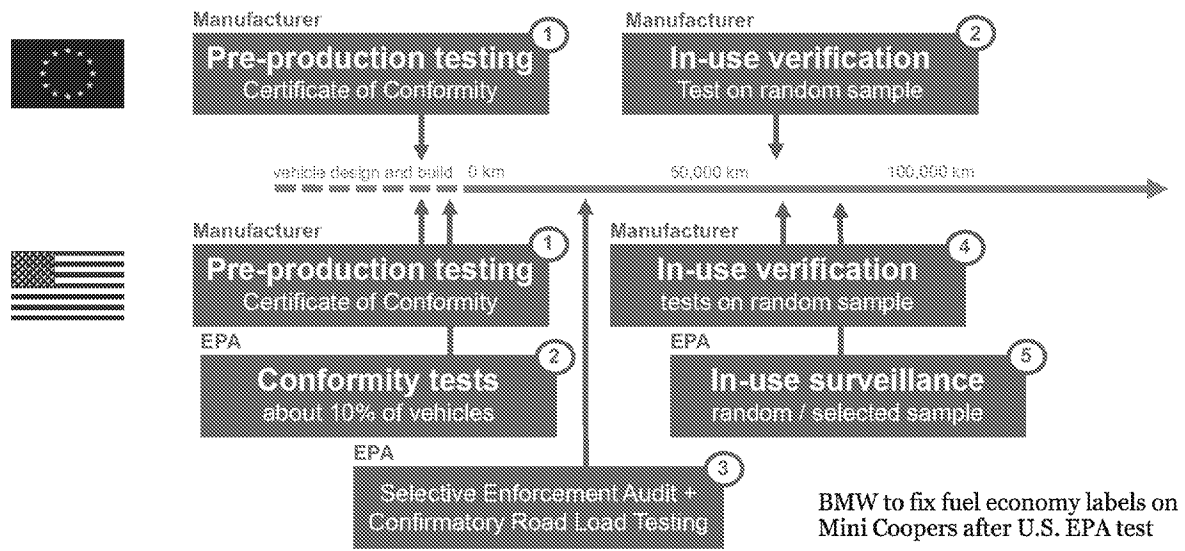
Use of emission control equipment that only works properly on the test cycles and allows much higher in-use emissions.

## What's next?

- Major shortfalls in existing government programs
- What's next for ICCT?

# Comparison of US & EU Compliance Programs

## No confirmatory testing in Europe



### U.S. Fines Hyundai, Kia for Fuel Claims

Penalty of \$100 million is Largest Ever, Could Set Precedent for Other Auto Makers

## ED\_006561\_00001614-00015

# Country Responses

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- US: Revised defeat device requirements and conducting random testing
- Switzerland: Stopped sales of all two-liter diesel Volkswagen cars that meet its Euro V emissions standards.
- UK: Series of exchanges requesting technology support from ICCT prior to announcement of a government vehicle testing program
- Germany: Both federal government and State of Baden-Württemberg are developing vehicle testing programs
- South Korea: Announced investigations into the VW diesel car models; technical institutions and academics have contacted us.
- France: Initial stages of establishing a testing protocol
- Italy and other EU member states: Have called for inquiries
- India: Government has directed the Automotive Research Association of India (ARAI) to carry out tests on Volkswagen cars
- China: Requested information from ICCT on VW models sold in China
- Mexico: Issued a press release announcing a new in-use testing program that would be supported by the ICCT.



# What's next for the ICCT?

## Multi-year strategy under development . . .

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### 1. Defeat Device Vehicle Testing

- \* Respond to immediate government requests for ICCT assistance on testing
- \* New test methods using cheap NOx sensors, OBD fuel use data, etc., under exploration.

### 2. International Best Practices

- \* The ICCT create new metrics and compare nations against each other to create a race to the top for compliance programs.
- \* Expand ICCT International Council to create a network of government officials dedicated to improved compliance

### 3. Country programs

- \* Start in Europe and China, the two largest markets with major shortcomings in compliance programs, and then expand to India, Mexico, Brazil, etc . . .
- \* Europe is currently revamping its test cycle and procedures, but needs improvements to the RDE requirements and regional institutional reform to enable recall testing, penalties, etc.
- \* China is newly empowered with recall authority and major penalties, but needs a credible testing program, institutional capacity, and a culture of compliance.

### 4. Strategic Partnerships

- \* Build on existing partnerships with government regulators and influential NGOs in local markets
- \* Partner with association of government legal enforcement agencies
- \* Explore collaboration with progressive institutional investors interested in improved risk assessment on auto makers.

# About the ICCT . . .

**International Council** Composed of top government regulators (~25) in major markets founded in 2001.

## Non-profit Organization

ICCT incorporated to serve International Council, staff of 40 technical experts on vehicles and fuels, half with background / nationality outside US founded in 2005. Offices in DC, San Francisco, Berlin Germany and Beijing China

## Board of Directors

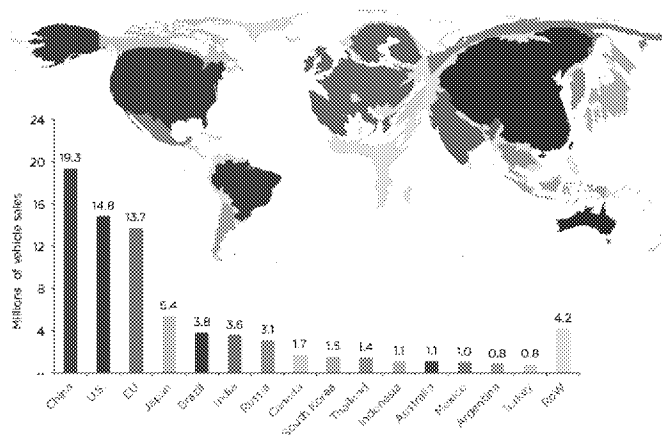
Dan Greenbaum, head of Health Effects Institute, chair of ICCT board.

## Funding

California philanthropies plus government grants and contracts.



Top 15 Car and Truck Markets by Sales in 2012



**Mission:** To dramatically improve environmental performance and efficiency of motor vehicles (cars, trucks, marine, aviation) and fuels by supporting government regulatory agencies in world's top vehicle markets.

**Geographic scope:** China, Europe, US, California, Japan, Brazil, India, Canada, South Korea, Indonesia, Australia, Mexico plus smaller markets by request.

# Contact Information

## Background and Additional Reading

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### Contact Information:

Drew Kodjak, Executive Director, (Washington DC), [drew@theicct.org](mailto:drew@theicct.org)  
John German, US program co-lead (Ann Arbor), [john@theicct.org](mailto:john@theicct.org)  
Anup Bandivadekar, Program Director (San Francisco), [anup@theicct.org](mailto:anup@theicct.org)

### Background and Additional Reading:

<http://www.theicct.org/news/epas-notice-violation-clean-air-act-volkswagen-press-statement>

<http://theicct.org/news/faq-use-nox-emissions-diesel-passenger-cars>

<http://www.nytimes.com/2015/09/22/business/it-took-epa-pressure-to-get-vw-to-admit-fault.html?smid=nytcore-iphone-share&smprod=nytcore-iphone>

[http://www.huffingtonpost.com/margo-t-oge/the-silver-lining-in-the-vw-emissions-cloud\\_b\\_8222726.html](http://www.huffingtonpost.com/margo-t-oge/the-silver-lining-in-the-vw-emissions-cloud_b_8222726.html)

<http://www.bbc.com/news/business-34519184>

[http://www.rolcall.com/news/the\\_volkswagen\\_emissions\\_scandal\\_and\\_the\\_epa\\_commentary-243996-1.html](http://www.rolcall.com/news/the_volkswagen_emissions_scandal_and_the_epa_commentary-243996-1.html)

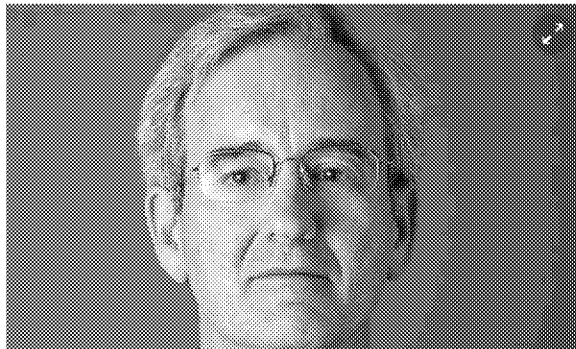


Additional slides

ICCT in the press

## Meet John German: the man who helped expose Volkswagen's emissions scandal

Automotive engineer's research connected the dots to how the automaker manipulated diesel emissions tests – but that was never the intention



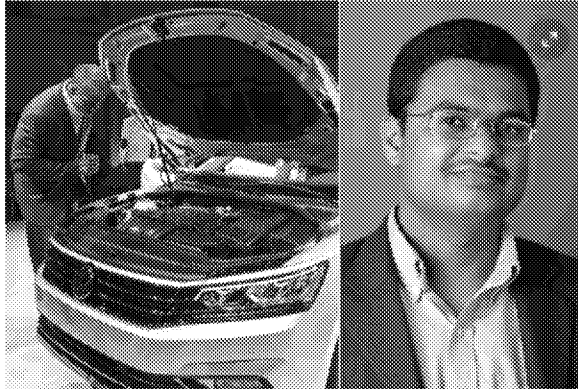
John German: "VW had a choice to fix the problem, and they continued to try and cheat and do what they had done. That's just amazing." Photograph: John German/ICCT

He's an unlikely media star, not a pop singer or reality TV contestant, but a grey-haired automotive engineer thrust into the global spotlight after he and his colleagues were credited with helping uncover one of the biggest ever corporate scandals.

When we made our spring 2014 report to the US authorities, we were not expecting this to become a global scandal. And we were very surprised to later discover that the second largest car manufacturer in the world had installed defeat devices on some of its models.



Environmental expert Anup Bandivadekar and his three colleagues revealed Volkswagen's emissions cheating. The scam includes eleven million cars and could cost VW \$25 billion.



Ingenjören Anup Bandivadekar vid miljöorganisationen ICCT i San Francisco avslöjade VW:s utsläppsfusk. Foto: Reuters, ICCT

## Volkswagen : l'homme par qui le scandale est arrivé

Drew Kodjak est le directeur exécutif de l'ICCT, l'ONG américaine qui a révélé l'affaire Volkswagen. L'homme par qui le scandale est arrivé insiste ce jeudi auprès du «Parisien» - «Aujourd'hui en France» sur la nécessité de mettre en place des tests sur route pour vérifier les émissions réelles des véhicules. Interview.

Propos recueillis par Frédéric Houchon | 24 Sept. 2015, 09H01 | MAJ : 24 Sept. 2015, 09H59

11 Photos 4 0 Testez 9 15+ 3 Rése



Pour Drew Kodjak, l'homme par qui le scandale est arrivé, « les gouvernements doivent développer des tests sur route pour vérifier les émissions polluantes réelles des véhicules ». (DR.)

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FOR CLEAN TRANSPORTATION

The man behind the revelation surrounding VW said that “this scandal is an alarm signal for Europe.”



# Die Welt

Monday, September 28

We had expected that diesel cars in the US would be cleaner and that we could get the data and say to Europe "Why can you not do this too?"

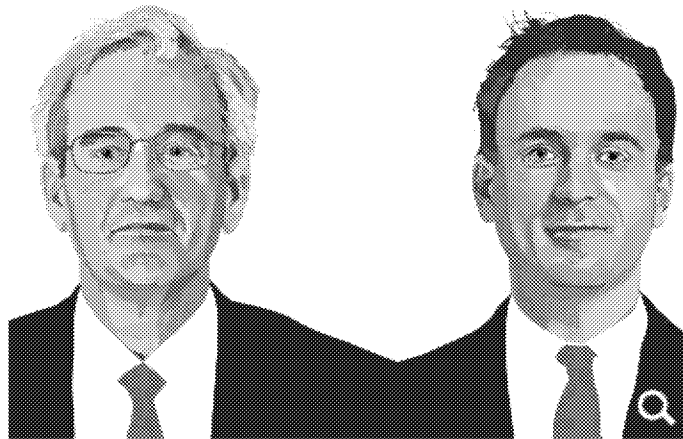


Foto: André Lammé

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John German (l.) und Peter Mock von der Umwiltobby ICCT geben die Studie in Auftrag, die Unregelmäßigkeiten bei Abgaswerten von VW-Dieselfahrzeugen aufdeckte

Francisco Posada put against the wall one of the most powerful companies in the world by finding a software bug altering greenhouse gas emissions in two models of VW diesel vehicles.



## Notable Quotes

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- “Defeat devices is the extreme — it is cheating, illegal activity, but there are big issues with respect to tests and whether they are being carried out in the spirit of the regulation or just by the book.” — Anup Bandivadikar, as quoted by The Hindu Business Line
- “I feel happy, but I also feel sad because there was enough data and people knew for a long time. The emissions in cities have not gone down like we expected and they could have been reduced a long time ago.” — Peter Mock, as quoted by The Guardian
- “We had already shown that emissions from European diesel cars exceeded the standards in normal traffic conditions. But we thought that this difference was due to a number of gaps in the European system, including the lack of a common authority to perform the tests. Our hypothesis was that in the United States, with the Clean Air Act, all cars would come out clean.” — Drew Kodjak as quoted by Le Monde
- “The International Council on Clean Transportation, a nonprofit research organization that works with governments to cut air pollution from mobile sources, and West Virginia University researchers uncovered Volkswagen’s alleged use of defeat devices in research and testing over the last couple of years.” — as quoted by the Wall Street Journal
- “Without vigilant enforcement, companies that comply with the standards will be placed at a competitive disadvantage. If left unchecked, that could undermine the whole regulatory framework.” — John German, as quoted by DownToEarth

